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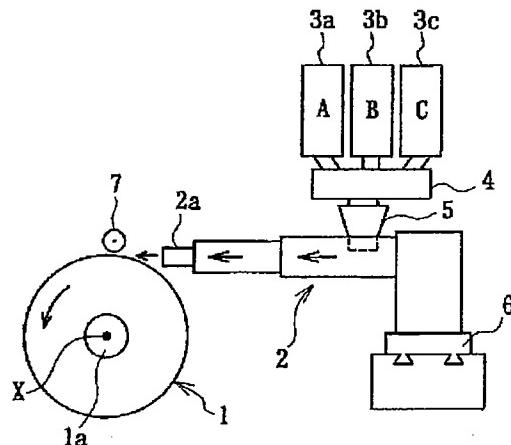
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(54)【発明の名称】 帯状未加硫ゴムの積層方法及び積層装置

(57)【要約】

【課題】 タイヤなどのゴム複合体における高耐久性、高性能、高精度のゴム部分の自動成型可能な高能率、低成本の帯状ゴムの積層方法及び積層装置を提供する。

【解決手段】 回転する支持体に押出機からの帯状ゴムを巻付けて積層ゴム部材を成型する方法及び装置において、供給ゴム材料に2種以上のゴム組成物を用い、回転支持体上に押出した第一ゴム材料の同種ゴム部材を成型し、その後第一ゴム材料に第二ゴム材料をブレンド比率の段階的増加及び漸増の少なくとも一方の増加でブレンドした両種ゴム材料を押し出し、同種ゴム部材の少なくとも一部とオーバーラップさせて第一の積層ゴム部材を成型する方法及び装置。



【特許請求の範囲】

【請求項1】 回転する支持体に、押出機から押出す帶状未加硫ゴムを螺旋巻回して、所定断面形状をもつ積層ゴム部材を成型するに当り、

押出機に供給するゴム材料に、加硫後モジュラスが、少なくとも供給順の2者間で互いに異なる2種以上のゴム組成物を用い、

第一のゴム材料を押出機から押出し、回転支持体上に、押出す帶状ゴムによる同種ゴム部材を成型し、

引き続き、同じ押出断面形状を保持した上で、第一のゴム材料に、第二のゴム材料を、ブレンド比率の段階的増加及び漸増の少なくとも一方の増加でブレンドした両種ゴム材料を押出機から押出し、回転支持体上に、押出す帶状ゴムを、上記同種ゴム部材の少なくとも一部とオーバーラップさせて、第一の積層ゴム部材を成型することを特徴とする帶状未加硫ゴムの積層方法。

【請求項2】 第一の積層ゴム部材の成型の後、引き続き、同じ押出断面形状を保持した上で、第二のゴム材料のみを押出機から押出し、回転支持体上に、押出す帶状ゴムを、第一の積層ゴム部材の少なくとも一部とオーバーラップさせて、第二の積層ゴム部材を成型する請求項1に記載した帶状未加硫ゴムの積層方法。

【請求項3】 第二の積層ゴム部材の成型に引き続き、同じ押出断面形状を保持した上で、第二のゴム材料のみに、第三のゴム材料を、ブレンド比率の段階的増加及び漸増の少なくとも一方の増加でブレンドした両種ゴム材料を押出機から押出し、回転支持体上に、押出す帶状ゴムを、第二の積層ゴム部材の少なくとも一部とオーバーラップさせて、第三の積層ゴム部材を成型する請求項2に記載した帶状未加硫ゴムの積層方法。

【請求項4】 第三の積層ゴム部材の成型の後、引き続き、同じ押出断面形状を保持した上で、第三のゴム材料のみを押出機から押出し、回転支持体上に、押出す帶状ゴムを、第三の積層ゴム部材の少なくとも一部とオーバーラップさせて、第四の積層ゴム部材を成型する請求項3に記載した帶状未加硫ゴムの積層方法。

【請求項5】 回転支持体の回転軸方向に沿って、回転支持体に対し、押出機から押出す帶状ゴムを、帶状ゴムの少なくとも幅方向縁部を相互にオーバーラップさせながら順次螺旋巻回してゴム部材を成型する請求項1～4のいずれか一項に記載した帶状未加硫ゴムの積層方法。

【請求項6】 2種以上のゴム材料に、加硫後において、100%モジュラス及び300%モジュラスの少なくとも一方のモジュラスが、供給順の2種間で1.0 MPa以上異なる物性を有するゴム組成物を用いる請求項1～5のいずれか一項に記載した帶状未加硫ゴムの積層方法。

【請求項7】 2種のゴム材料に、加硫後タイヤのインナーライナ用ゴム組成物を適用し、第一のゴム材料に、エアー不透過性のハロゲン化ブチルゴム組成物及びブチ

ルゴム組成物の少なくとも一方を用い、第二のゴム材料に、天然ゴム組成物及び天然ゴム系合成ゴム組成物の少なくとも一方を用いる請求項1、2、5、6のいずれか一項に記載した帶状未加硫ゴムの積層方法。

【請求項8】 3種のゴム材料に、加硫後タイヤのトレッドアンダーカッショング用ゴム組成物、トレッドベース用ゴム組成物及びトレッドキャップ用ゴム組成物を適用し、この順に第一のゴム材料、第二のゴム材料及び第三のゴム材料として押出す請求項1、3、4、5、6のいずれか一項に記載した帶状未加硫ゴムの積層方法。

【請求項9】 3種のゴム材料に、加硫後タイヤのビードフィラ用ゴム組成物、サイドウォール用ゴム組成物及びゴムチャーファ用ゴム組成物を適用し、この順に第一のゴム材料、第二のゴム材料及び第三のゴム材料として押出す請求項1、3、4、5、6のいずれか一項に記載した帶状未加硫ゴムの積層方法。

【請求項10】 表面上に未加硫の帶状ゴムの巻付面を有する回転可能な支持体と、該回転支持体の巻付面に帶状ゴムを供給する押出機と、該押出機に2種以上のゴム材料を個別に供給する2個以上のゴム材料供給装置とを有し、

各ゴム材料供給装置は、ゴム材料の重量を計量し、ゴム材料の単位時間当たりの供給量を調整する供給量調整手段を備えることを特徴とする帶状未加硫ゴムの積層装置。

【請求項11】 押出機は、供給量調整手段を介し押出機に計量ゴム材料を投入する時期と、このゴム材料の投入停止時期とを制御する制御手段を備える請求項10に記載した帶状未加硫ゴムの積層装置。

【請求項12】 支持体及び押出機のいずれか一方は、支持体の回転軸に沿って相対移動可能な移動機構を有する請求項10又は11に記載した帶状未加硫ゴムの積層装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 この発明は、帶状未加硫ゴムの積層方法及び積層装置、より詳細には、加硫後のモジュラス（弹性率）が異なる2種以上の未加硫ゴム材料を押出機により押し出し、押出した帶状ゴムを回転支持体上に積層して組をなすゴム部材とする方法及びその方法を実現する装置に関し、特に、空気入りタイヤの成型に係る帶状未加硫ゴムの積層方法及び積層装置に関する。

【0002】

【従来の技術】 一般に、各種ゴムを有する複合体は、製造に際し、複合体の加硫前に、各種の未加硫ゴム部材を張合わせる工程が必要である。各種ゴムと各種補強材との複合体の場合も上記と同じである。この複合体が空気入りタイヤ（以下タイヤという）の場合、タイヤは、ゴム被覆コードなどの補強部材と、各種のゴム部材とからできている。従って、タイヤ加硫前に、成型工程にて、未加硫ゴム材料や未加硫ゴム被覆コード材料などの補強

3 材料を張合わせた未加硫タイヤを準備する。

【0003】ところが、今日では、タイヤを含むゴム複合体に対する要求特性は、益々高度化し、かつ、益々多様化する傾向を示している。この傾向に合わせ、ゴム複合体の構成部材やタイヤ構成部材も益々多様化している。従って、成型工程も益々複雑にならざるを得ない。その結果、成型工程の完全自動化が困難となり、依然として人手作業を必要としているのが現状である。しかし、人手作業を加えると、成型効率の大幅向上は達成できず、また、各種材料の張付精度が低下する。特にタイヤの場合、張付精度の良否はタイヤ品質を左右するため、成型効率向上と共に精度向上が強く望まれている。

【0004】そこで、これら要望に応えるため、タイヤにつき、特公平7-94155号公報は、回転する支持体上にゴム材料を配置する位置近傍に定容押出機の出口オリフィスを位置させ、定容押出機から出口オリフィスを介し支持体上にゴム材料を直接押出す方法及び装置を提案している。

【0005】

【発明が解決しようとする課題】その一方で、タイヤやその他のゴム複合体に対する要求特性の高度化及び多様化は、タイヤ各部やゴム複合体各部におけるゴムに最適物性を要求する。この要求に対応するため、結果として、隣接ゴム間で著しく大きなモジュラス差などの物性差が生じる。

【0006】このことは、タイヤについて言えば、タイヤの多くの部分に、大きなモジュラス段差を呈する接合面を有するということである。従って、荷重負荷の下で、数万km以上もの長距離を走行するタイヤの、これら接合面に、ひずみが長期間にわたり繰り返し集中して作用する。その結果、これら接合面にセパレーションなどの故障が発生し易く、耐久性が低下する。

【0007】しかし、上記公報は、この種の故障や耐久性保持乃至耐久性向上の対応について触れていない。また一方、タイヤは、ゴム複合体を含め、耐久性とその他の性能とは、互いに二率背反的要素を有する。すなわち、一方で耐久性の向上を狙えば、その他の性能低下を招く。他方でその他の性能向上を狙えば耐久性の低下を招く。従って、各ゴムは、両者を適宜妥協した物性設計のゴム組成物となり、各ゴムの最適設計が実現できないでいる。

【0008】この種の問題に関し、特公昭40-24384号公報は、一つの解決方法を示唆している。すなわち、同公報は、複数の異なる未加硫ゴム材料を未加硫カーカス部材に張付けるに際し、一つの未加硫ゴム材料から他の未加硫ゴム材料に漸次的に移り変わりながら、タイヤの所定部分を形成させる製造方法を提案している。

【0009】しかし、同上公報の開示は、複数の未加硫ゴム材料の数に対応する数のロール装置と、複数の未加硫ゴム材料の混合ロール装置とを用いる点で、膨大なス

ペースを要する。またロール装置相互間及び最終ロール装置と未加硫ゴム材料の張付け位置との間で、各種の未加硫ゴムストリップに制御し難い変形が生じる。そのため精密な断面形状の未加硫ゴム部材を、未加硫カーカス部材上に成形することは困難を極める。これらの問題から、同上公報が開示する製造方法を、成型自動化に適用することはできない。

【0010】従って、この発明の請求項1～9に記載した発明は、タイヤやその他のゴム複合体の製造に際し、10 前述の諸問題の全面解決を目指し、省スペースでの成型自動化を前提とした上で、タイヤやその他のゴム複合体の十分な耐久性保持と各ゴムへの最適設計ゴム組成物の適用とを両立させ、各ゴムの高精度な所望断面形状及び精密な所望配置の実現とが可能な、高生産性の帯状未加硫ゴムの積層方法を提供することを目的その一とする。

【0011】また、この発明の請求項10～12に記載した発明は、請求項1～9に記載した発明を実現するための一つの装置として、簡単、コンパクトで低コストの帯状未加硫ゴムの積層装置を提供することを目的その二とする。

【0012】

【課題を解決するための手段】前記目的その一を達成するため、この発明の請求項1に記載した発明は、回転する支持体に、押出機から押出す帯状未加硫ゴムを螺旋巻回して、所定断面形状をもつ積層ゴム部材を成型するに当り、押出機に供給するゴム材料に、加硫後モジュラスが、少なくとも供給順の2者間で互いに異なる2種以上のゴム組成物を用い、第一のゴム材料を押出機から押し出し、回転支持体上に、押出す帯状ゴムによる同種ゴム部材を成型し、引き続き、同じ押出断面形状を保持した上で、第一のゴム材料に、第二のゴム材料を、ブレンド比率の段階的増加及び漸増の少なくとも一方の増加でブレンドした両種ゴム材料を押出機から押し出し、回転支持体上に、押出す帯状ゴムを、上記同種ゴム部材の少なくとも一部とオーバーラップさせて、第一の積層ゴム部材を成型することを特徴とする帯状未加硫ゴムの積層方法である。

【0013】ここに、支持体とは、成型ドラム、成型ドラム上に一部の未加硫ゴム部材や未加硫ゴム被覆コードなどを巻付けた成型途中体、及び更生用台タイヤなどをさす。なお、成型ドラムは、通常の円筒状をなすドラムと、円周方向に分離可能な環状（トロイド状）セグメント集合体とを含む。

【0014】請求項1に記載した発明をさらに発展させて、請求項2に記載した発明のように、第一の積層ゴム部材の成型の後、引き続き、同じ押出断面形状を保持した上で、第二のゴム材料のみを押出機から押し出し、回転支持体上に、押出す帯状ゴムを、第一の積層ゴム部材の少なくとも一部とオーバーラップさせて、第二の積層ゴム部材を成型する。

【0015】請求項2に記載した発明をさらに発展させて、請求項3に記載した発明のように、第二の積層ゴム部材の成型に引き続き、同じ押出断面形状を保持した上で、第二のゴム材料のみに、第三のゴム材料を、ブレンド比率の段階的増加及び漸増の少なくとも一方の増加でブレンドした両種ゴム材料を押出機から押出し、回転支持体上に、押出す帶状ゴムを、第二の積層ゴム部材の少なくとも一部とオーバーラップさせて、第三の積層ゴム部材を成型する。

【0016】請求項3に記載した発明をさらに発展させて、請求項4に記載した発明のように、第三の積層ゴム部材の成型の後、引き続き、同じ押出断面形状を保持した上で、第三のゴム材料のみを押出機から押出し、回転支持体上に、押出す帶状ゴムを、第三の積層ゴム部材の少なくとも一部とオーバーラップさせて、第四の積層ゴム部材を成型する。

【0017】請求項1～4に記載した発明に関し、請求項5に記載した発明のように、回転支持体の回転軸方向に沿って、回転支持体に対し、押出機から押出す帶状ゴムを、帶状ゴムの少なくとも幅方向縁部を相互にオーバーラップさせながら順次螺旋巻回してゴム部材を成型する。

【0018】請求項1～5に記載した発明に関し、好適には、請求項6に記載した発明のように、2種以上のゴム材料に、加硫後において、100%モジュラス及び300%モジュラスの少なくとも一方のモジュラスが、供給順の2種間で1.0MPa以上異なる物性を有するゴム組成物を用いる。

【0019】請求項1、2、5、6に記載した発明に関し、実際に、請求項7に記載した発明のように、2種のゴム材料に、加硫後タイヤのインナーライナ用ゴム組成物を適用し、第一のゴム材料に、エアー不透過性のハロゲン化ブチルゴム組成物及びブチルゴム組成物の少なくとも一方を用い、第二のゴム材料に、天然ゴム組成物及び天然ゴム系合成ゴム組成物の少なくとも一方を用いる。

【0020】請求項1、3、4、5、6に記載した発明に関し、実際に、請求項8に記載した発明のように、3種のゴム材料に、加硫後タイヤのトレッドアンダーキャッショングム組成物、トレッドベース用ゴム組成物及びトレッドキャップ用ゴム組成物を適用し、この順に第一のゴム材料、第二のゴム材料及び第三のゴム材料として押出す。

【0021】また、請求項1、3、4、5、6に記載した発明に関し、実際に、請求項9に記載した発明のように、3種のゴム材料に、加硫後タイヤのビードフィラ用ゴム組成物、サイドウォール用ゴム組成物及びゴムチーフア用ゴム組成物を適用し、この順に第一のゴム材料、第二のゴム材料及び第三のゴム材料として押出す。

【0022】前記目的その二を達成するため、この発明

の請求項10に記載した発明は、表面に未加硫の帯状ゴムの巻付面を有する回転可能な支持体と、該回転支持体の巻付面に帯状ゴムを供給する押出機と、該押出機に2種以上のゴム材料を個別に供給する2個以上のゴム材料供給装置とを有し、各ゴム材料供給装置は、ゴム材料の重量を計量し、ゴム材料の単位時間当たりの供給量を調整する供給量調整手段を備えることを特徴とする帯状未加硫ゴムの積層装置である。

【0023】請求項10に記載した発明に関し、請求項11に記載した発明のように、押出機は、供給量調整手段を介し押出機に計量ゴム材料を投入する時期と、このゴム材料の投入停止時期とを制御する制御手段を備える。

【0024】また、請求項10、11に記載した発明に関し、請求項12に記載した発明のように、支持体及び押出機のいずれか一方は、支持体の回転軸に沿って相対移動可能な移動機構を有する。

【0025】

【発明の実施の形態】以下、この発明の実施の形態を図1～図10に基づき説明する。図1は、この発明の帯状未加硫ゴムの積層装置の概要を示す側面図であり、図2は、第一の積層ゴム部材の模式的断面図であり、図3は、図2に示す第一の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図であり、図4は、第二の積層ゴム部材の模式的断面図であり、図5は、図4に示す第二の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図であり、図6は、第三の積層ゴム部材の模式的断面図であり、図7は、図6に示す第三の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図であり、図8は、第四の積層ゴム部材の模式的断面図であり、図9は、図8に示す第四の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図であり、図10は、図8に示す第四の積層ゴム部材の加硫後における各ゴムのモジュラス分布の説明図である。

【0026】図1において、支持体1は、図示を省略した回転駆動源の駆動により回転する軸1aに取付ける。支持体1は、成型ドラム、成型ドラム上に一部の未加硫ゴム部材や未加硫ゴム被覆コードなどを巻付けた成型途中体、及び更生用台タイヤなどである。支持体1は、その表面に未加硫帯状ゴム（以下帯状ゴムという）の巻付面を有する。なお、台タイヤとは、使用済タイヤの残余トレッドゴムなどを除去したタイヤである。

【0027】支持体1の表面近傍に、押出機2の帯状ゴム供給部2aが位置するように、押出機2を配置する。ここに、帯状ゴム積層装置は、支持体1と押出機2との組合せ装置である。供給部2aは、通常の押出口金を備える場合と、押出口金の代わりに上下一対のローラダイを備える場合との双方を含む。

【0028】押出機2は、2種以上、図示例は3種の未

加硫ゴム材料（以下ゴム材料という）A、B、Cを個別に供給するゴム材料供給装置3a、3b、3cを有する。また、ゴム材料供給装置3a、3b、3cは、ゴム材料A、B、Cの供給量をそれぞれ個別に調整する供給量調整手段4を備える。供給量調整手段4を経たゴム材料A、B、Cは、ホッパ乃至フィーダ5を介して押出機2の本体に投入する。

【0029】また、図示を省略したが、押出機2は、ゴム材料A、B、C全般にわたり、供給量調整手段4を介して押出機2に計量ゴム材料を投入する時期と、このゴム材料の投入停止時期とを制御する制御手段を有する。

【0030】また、押出機2は直状移動機構6を備える。直状移動機構6は、支持体1の回転軸1aの中心軸線Xに沿って押出機2を直状に移動させる。この移動は、供給部2aから供給する帯状ゴムを、支持体1の巻付面に対し螺旋状に順次巻回するためのものである。

【0031】従って、直状移動機構6の代わりに、支持体1が直状移動機構（図示省略）を備えてもよい。さらに、支持体1の巻付面が大きな曲率をもつ曲面である場合には、押出機2は、直状移動機構6に加え、旋回移動機構（図示省略）を備える。旋回移動機構は、供給部2a先端を支持体1の巻付曲面に沿って旋回させる。

【0032】帯状ゴム積層装置は、押出機2の供給部2aの前方にガイドローラ7を有する。ガイドローラ7は、供給部2aから供給する帯状ゴムを、回転する支持体1の巻付面の所定位置に案内する。

【0033】以上述べた帯状ゴム積層装置を用いて、回転する支持体1に、押出機2から押出す帯状ゴムを順次螺旋巻回して巻付け、所定断面形状をもつ積層ゴム部材を成型する方法を、以下、説明する。

【0034】押出機2に供給するゴム材料A、B、Cは、加硫後において、100%モジュラス及び300%モジュラスの少なくとも一方のモジュラスが、供給順の2種ゴム材料間で1.0MPa以上異なる物性を有するゴム組成物である。すなわち、ゴム材料A、B、Cの順序で各ゴム材料を押出機2に供給するとき、上記モジュラスが、ゴム材料A、B間で1.0MPa以上異なり、ゴム材料B、C間で1.0MPa以上異なる、ということである。これら2種ゴム材料間で、いずれのゴム材料がより大きなモジュラスをもつかは問わない。以下、供給順は上記の通りとして述べる。

【0035】そこで、第一のゴム材料Aを押出機2に供給し、押出した帯状ゴムAを回転する支持体1（以下回転支持体1という）上に順次螺旋巻回して巻付け、同種ゴム部材Aを成型する。この成型に引き続き、帯状ゴムAと同じ押出断面形状を保持した上で、第一のゴム材料Aに、第二のゴム材料Bを加えたブレンド部材（A+B）を押出機2に供給する。押出機2から押出した帯状ブレンドゴム（A+B）を回転支持体1上に順次螺旋巻回して巻付け、第一の積層ゴム部材{A+(A+B)}

を成型する。

【0036】このとき、第二のゴム材料Bのブレンド比率は、段階的増加及び漸増の少なくとも一方の増加形態をとらせる。ここに、ブレンド比率増加形態は、段階的増加のみの場合、漸増のみの場合及び段階的増加と漸増との組合せの場合の三者を含む。以下全て同じである。

【0037】また、回転支持体1上に巻付ける帯状ゴムAと帯状ブレンドゴム（A+B）との螺旋巻回は、次の通りとする。すなわち、回転支持体1の回転軸1aの軸線X方向に沿って、回転支持体1に対し、帯状ゴムA及び帯状ブレンドゴム（A+B）を、これらの少なくとも幅方向縁部を相互にオーバーラップさせながら、順次螺旋巻回してゴム部材A、（A+B）を成型する。また、同様に、帯状ブレンドゴム（A+B）は、同種ゴム部材Aの少なくとも一部とオーバーラップさせる。これらのオーバーラップ構成は、以下に述べる全ての積層ゴム部材に共通する。

【0038】以上述べた帯状ゴムの積層方法を以下に述べる積層方法の基本とし、この方法その一に従い成型した第一の積層ゴム部材の、回転支持体1の軸線X方向断面を模式図として図2に示す。図2に示す第一の積層ゴム部材は、図の右側から回転支持体1への巻付けを開始し、帯状ゴムAと帯状ブレンドゴム（A+B）とを比較的小さな送りピッチpで螺旋巻回したものである。この積層形態は、いわばリボン形であるが、後述するモザイク形でも良い。

【0039】図3は、図2に示す第一の積層ゴム部材を成型する際に、押出機2に供給するゴム材料A、Bの供給比率（%）と供給時間（t）との関係を説明する線図である。図3において、供給開始時間t0から供給時間t1までは、ゴム材料Aのみを押出機2に供給する。供給時間t1からゴム材料Bのブレンドを開始する。供給開始時間t0から供給終了時間tEまでの間は、ゴム材料Aとゴム材料Bとの供給量の総和を100%とする。なお、供給量は容積とする。以下、同じである。

【0040】方法その二を説明する。すなわち、方法その一による第一の積層ゴム部材{A+(A+B)}成型の後、引き続き、帯状ブレンドゴム（A+B）と同じ押出断面形状を保持した上で、第二のゴム材料Bのみを押出機2から押出す。出した帯状ゴムBを、回転支持体1の第一の積層ゴム部材{A+(A+B)}上に順次螺旋巻回して巻付け、第二の積層ゴム部材{A+(A+B)+B}を成型する。このとき、帯状ゴムBはブレンドゴム部材（A+B）の少なくとも一部とオーバーラップさせる。

【0041】方法その二に従い成型した第二の積層ゴム部材の、回転支持体1の軸線X方向断面を模式図として図4に示す。図5は、図4に示す第二の積層ゴム部材を成型する際に、押出機2に供給するゴム材料A、Bの供給比率（%）と供給時間（t）との関係を説明する線図

である。図5において、ゴム材料Bは供給時間t1にて供給を開始し、ゴム材料Aは供給時間t2にて供給を停止させる。供給開始時間t0から供給終了時間tEまでの間は、各ゴムの供給総量は100%である。

【0042】方法その三を説明する。すなわち、方法その二による第二の積層ゴム部材{A+(A+B)+B}成型の後、引き続き、第二のゴム材料Bのみに第三のゴム材料Cを加えたブレンド部材(B+C)を押出機2に供給する。押出機2から押出した帯状ブレンドゴム(B+C)を回転支持体1の第二の積層ゴム部材{A+(A+B)+B}上に順次螺旋巻回して巻付け、第三の積層ゴム部材{A+(A+B)+B+(B+C)}を成型する。

【0043】このとき、第三のゴム材料Cのブレンド比率及び帯状ゴムの螺旋巻回におけるオーバーラップ構成は先に述べた通りである。

【0044】方法その三に従い成型した第三の積層ゴム部材の、回転支持体1の軸線X方向断面を模式図として図6に示す。図7は、図6に示す第三の積層ゴム部材を成型する際に、押出機2に供給するゴム材料A、B、Cの供給比率(%)と供給時間(t)との関係を説明する線図である。図7において、ゴム材料Bは供給時間t1にて供給を開始し、ゴム材料Aは供給時間t2にて供給を停止させ、ゴム材料Cは供給時間t3にて供給を開始する。供給開始時間t0から供給終了時間tEまでの間は、各ゴムの供給総量は100%である。

【0045】方法その四を説明する。すなわち、方法その三による第三の積層ゴム部材{A+(A+B)+B+(B+C)}成型の後、引き続き、第三のゴム材料Cのみを押出機2に供給する。押出機2から押出した帯状ゴムCを回転支持体1の第三の積層ゴム部材{A+(A+B)+B+(B+C)}上に順次螺旋巻回して巻付け、第四の積層ゴム部材{A+(A+B)+B+(B+C)+C}を成型する。このとき、帯状ゴムの螺旋巻回におけるオーバーラップ構成は先に述べた通りである。

【0046】方法その四に従い成型した第四の積層ゴム部材の、回転支持体1の軸線X方向断面を模式図として図8に示す。図9は、図8に示す第三の積層ゴム部材を成型する際に、押出機2に供給するゴム材料A、B、Cの供給比率(%)と供給時間(t)との関係を説明する線図である。図9において、ゴム材料Bは供給時間t1にて供給を開始し、ゴム材料Aは供給時間t2にて供給を停止させ、ゴム材料Cは供給時間t3にて供給を開始し、ゴム材料Bは供給時間t4にて供給を停止する。供給開始時間t0から供給終了時間tEまでの間は、各ゴムの供給総量は100%である。

【0047】以上述べた方法その一～その四におけるゴム材料A、B、Cは、符号が同じであっても、各方法間で必ずしも同じゴム組成物ではなく、各方法それぞれにより異なるゴム組成物である。これらゴム材料A、B、

Cの投入時期、投入時間経過に伴う投入量の変更及び投入停止時期などを、供給量調整手段4及びその制御手段によりコントロールする。

【0048】積層方法その一～その四によれば、以下

(1)～(6)に述べる効果を奏する。

(1) 図10に示すように、加硫後の積層ゴムにおいて、従来は、隣接ゴムA、B相互間に、隣接ゴムB、C相互間に大きな剛性段差が生じていた。しかし、この発明によれば、図に曲線で示すように、それぞれの隣接ゴム相互間の剛性段差を解消することができる。その結果、従来、隣接ゴム境界面に生じていたセパレーションなどの剥離故障発生を回避することができ、積層ゴム体の耐久性を大幅に向上させることができる。

【0049】(2) 従来は、隣接ゴムA、B乃至隣接ゴムB、Cのうち一方ゴム材料が他方のゴム材料に対し、成型時にグリーンタッキネス不足で接着不良が生じていた問題を、この発明の積層方法により完全に解消することができる。これにより、未加硫時の接着不良に基づく製造不良発生は皆無となる。

【0050】(3) 従来は、例えば、一方ゴムがハロゲン化ブチルゴム組成物及びブチルゴム組成物であり、その隣接ゴムがNBR(天然ゴム)系、IIR(イソブレンゴム)系、SBR(ステレン-ブタジエンゴム)系、これらのブレンド系などのゴム組成物のとき、加硫後の接着力が極めて不十分である。しかし、いかなるゴムを使用しても、この発明の積層方法により、十分に強力な接着力を得ることができる。

【0051】(4) 押出機2により、回転支持体1に螺旋巻回し巻付ける帯状ゴムを押出すことにより、容易にゴム材料を連続して変更することができる。その結果、成型の完全自動化が容易となり、かつ、成型に要する総工数を大幅に低減することができ、生産性が大幅に向上する。

【0052】(5) 各帯状ゴムのゲージ及び幅を適宜設定することができる。また、押出機2の供給部2a先端を回転支持体1に近接させること、回転支持体1に巻付ける帯状ゴムを、相互に幅方向に一部(縁部)オーバーラップさせること、同時に、巻付ける帯状ゴムを、先に螺旋巻回したゴム部材の少なくとも一部とオーバーラップさせること、の組合せにより、仕上がり各ゴム部材の断面形状を、所望の形状に、高精度に、そして高能率で実現することができる。

【0053】(6) 加硫後の積層ゴムにブレンドゴム領域を形成するので、隣接ゴムの物性などに気遣いなく、ゴム材料A、B、Cそれぞれに対し、単独で、最適物性設計を施すことができる。その結果、加硫後の積層ゴムは、理想的に高度の性能を発揮することができる。

【0054】

【実施例】この発明の帯状ゴム積層方法をタイヤに適用した実施例を、図11に基づき説明する。図11は、タ

イヤの回転軸線を含む平面による左半断面図である。図11において、タイヤ10は、一对のビード部11(片側のみ示す)と、一对のサイドウォール部12(片側のみ示す)と、トレッド部13とを有する。また、タイヤ10は、ビード部11内に埋設した一对のビードコア14相互間にわたり各部11、12、13を補強する1プライ以上のラジアルカーカス15と、ラジアルカーカス15の外周でトレッド部13を強化するベルト16とを備える。ラジアルカーカス15の端末部は、対をなすビードコア14の間に係止する。

【0055】またタイヤ10は、その外側ゴム部材として、ビード部11にチーファゴム17と、サイドウォール部12にサイドウォールゴム18と、トレッド部13のベルト16の外周側にトレッドゴム19とを有する。

【0056】さらに、タイヤ10は、その内側ゴム部材としてインナーライナゴム20を有し、ビード部11からサイドウォール部12の内部補強ゴム部材としてビードフィラゴム21を有する。また、ときに、タイヤ10は、その外側ゴム部材として、サイドウォールゴム18とトレッドゴム19との橋渡し役を果たすミニサイドウォールゴム22を備える。

【0057】また、トレッドゴム19は、一般に、ベルト16との接着を確保するためのトレッドアンダークッションゴム23を最内側に、トレッドベースゴム24を中間層に、そしてトレッドキャップゴム25の多層構造を有する。

【0058】(実施例その一)ここに、自動車用タイヤは、現今、殆ど全てがチューブレス(以下T/Lといふ)タイヤである。T/Lタイヤの重要な基本特性は充てん空気の気密保持性である。そのため、インナーライナゴム20には、エアー不透過性のハロゲン化ブチルゴム組成物及びブチルゴム組成物の少なくとも一方を用いる。

【0059】その一方、ラジアルカーカス15の補強コードの被覆ゴムはNR系、IR系、SBR系のゴム組成物である。これらの系のゴム組成物とハロゲン化ブチルゴム組成物及びブチルゴム組成物とは、加硫後の接着性が劣る。その結果、両種ゴム間で剥離が生じることが多い。よって、インナーライナゴム20に、先に説明した方法その一に従う第一の積層ゴム部材{A+(A+B)}又は方法その二に従う第二の積層ゴム部材{A+(A+B)+B}のいずれかを適用する。この場合、ゴム部材Aとゴム部材(A+B)とは、またゴム部材(A+B)とゴム部材Bとほぼ全域でオーバーラップさせる。

【0060】ゴム材料Aには、NR系、IR系、SBR系のゴム組成物を適用する。ゴム材料Bには、ハロゲン化ブチルゴム組成物及びブチルゴム組成物を適用する。このようにすれば、ラジアルカーカス15に近いゴム組

成物程、補強コードの被覆ゴム組成物に近づく。その結果、補強コードの被覆ゴムとインナーライナゴム20との間の剥離故障を阻止することができる。なお、補強コードの被覆ゴムは、ハロゲン化ブチルゴム組成物及びブチルゴム組成物に比し、1MPa以上高い100%モジュラス及び300%モジュラスを有する。

【0061】(実施例その二)図11に一点鎖線の丸で示す α 領域(トウ部)には、リム擦れ抵抗性に優れた超硬質のチーファゴム17と軟質のインナーライナゴム20との境界面が存在する。このため、タイヤ10のリム組時、リム解き時にトウ欠け故障が生じ易い。よって、チーファゴム17とインナーライナゴム20とに、方法その三に従う第三の積層ゴム部材{A+(A+B)+B+(B+C)}又は方法その四に従う第四の積層ゴム部材{A+(A+B)+B+(B+C)+C}を適用する。

【0062】この場合、インナーライナゴム20は、先に第二の積層ゴム部材{A+(A+B)+B}を適用し、その後、ゴム材料Cにチーファゴム17用BR(ブタジエンゴム)系ゴム組成物を用い、第三の積層ゴム部材{A+(A+B)+B+(B+C)}又は第四の積層ゴム部材{A+(A+B)+B+(B+C)+C}を完成させる。この場合、ゴム部材(B+C)又は積層ゴム部材{(B+C)+C}は、積層ゴム部材{A+(A+B)+B}の両側一部とオーバーラップさせる。なおチーフアゴム17は、100%モジュラスが4.0~8.0MPaであり、ゴム材料Bの加硫後100%モジュラスより1MPa以上高い。これでトウ欠けを回避することができる。

【0063】(実施例その三)図11に一点鎖線の丸で示す β 領域には、タイヤ10の荷重負荷直下で大きな曲げひずみが発生する。その一方、100%モジュラスが、耐候性及び耐屈曲性に優れたサイドウォールゴム18は1.0~2.5MPaであり、ビード部11の補強強化を目的とするビードフィラゴム21は5.0~10.0MPaである。よって、 β 領域は、ゴムの厚さ方向でみて、図10に示すモジュラス配列形態を呈する。このモジュラス段差により、しばしば、 β 領域にゴム界面剥離故障が生じる。

【0064】よって、ビードフィラゴム21と、サイドウォールゴム18と、チーフアゴム17とに、方法その四に従う第四の積層ゴム部材{A+(A+B)+B+(B+C)+C}を適用する。ゴム部材Aはビードフィラゴム21のゴム組成物、ゴム部材Bはサイドウォールゴム18のゴム組成物、ゴム部材Cはチーフアゴム17のゴム組成物とする。この第四の積層ゴム部材を用いることで、図10に示すように、モジュラス分布は曲線状となり、実際上、モジュラス段差は無くなる。その結果、ゴム界面剥離故障は発生しなくなる。この場合も、各積層ゴム部材は、相互間で一部のオーバーラップ

とする。

【0065】(実施例その四)図11に一点鎖線の丸で示すγ領域には、タイヤ10の荷重負荷直下で大きなひずみが発生する。その一方、300%モジュラスが、スチールコードの被覆に適合する高モジュラスの被覆ゴムと同種のトレッドアンダークッションゴム23は15~18MPaであり、クッション性に富むトレッドベースゴム24は5~12MPaであり、耐摩耗性や操縦安定性に優れるトレッドキャップゴム25は7~13MPaである。實際上は、隣接ゴム間で1.0MPa以上のモジュラス差を有する。よって、γ領域も、ゴムの厚さ方向でみて、図10に示すモジュラス配列形態を呈する。このモジュラス段差により、しばしば、γ領域にゴム境界剥離故障が生じる。

【0066】よって、トレッドゴム19に、方法その四に従う第四の積層ゴム部材{A+(A+B)+B+(B+C)+C}を適用する。ゴム部材Aはトレッドアンダーケッションゴム23のゴム組成物、ゴム部材Bはトレッドベースゴム24のゴム組成物、ゴム部材Cはトレッドキャップゴム25のゴム組成物とする。この第四の積層ゴム部材を用いることで、図10に示すように、モジュラス分布は曲線を示し、實際上、モジュラス段差は無くなる。その結果、ゴム境界面剥離故障は発生しなくなる。この場合の各積層ゴム部材は、相互間でほぼ全幅にわたるオーバーラップとする。

【0067】方法その四をさらに発展させ、導電性に優れるミニサイドウォールゴム22も、そのゴム組成物をゴム材料Dとして、第五の積層ゴム部材を成型することもできる。この場合、ゴム材料Dはサイドウォールゴム18のゴム組成物とする。ゴム材料Dを有する積層ゴム部材は、他の積層ゴム部材の両側一部とオーバーラップさせる。

【0068】(その他の実施例)図12は、自動車のエンジンマウントブロックの断面図である。図12において、エンジンマウントブロック30は、一方で、成るべく高い制振効果を有するゴムを必要とし、他方で耐候性に優れるゴムを必要とする。よって、エンジンマウントブロック30に、方法その二に従う第二の積層ゴム部材{A+(A+B)+B}を適用する。

【0069】すなわち、エンジンマウントブロック30の外側ゴムに、耐候性に優れるゴム組成物のゴム材料Aを用い、内側ゴムに高い制振効果を有するゴム組成物のゴムBを用いる。これにより互いに相反するゴム物性を用いて、要求性能を十分に充足させることができる。この場合も、ゴム部材A、ゴム部材(A+B)及びゴム部材Bは、ほぼ全域でオーバーラップさせる。エンジンマウントブロック30以外に、説明は省略するが、防振ゴム、防舷材などに、方法その一~その四、その発展方法を用いる。

【0070】

【発明の効果】この発明の請求項1~9に記載した発明によれば、タイヤやその他のゴム複合体の製造に際し、省スペースでの成型自動化の下で、タイヤやその他のゴム複合体の十分な耐久性保持と各ゴムへの最適設計ゴム組成物の適用とを両立させることができ、各ゴムの高精度な所望断面形状と精密な所望配置とを容易に実現させることができ、高生産性の帯状未加硫ゴムの積層方法を提供することができる。また、この発明の請求項10~12に記載した発明によれば、簡単でコンパクトな構造を有し、請求項1~9に記載した発明を確実に実現させることができ、可能な低コストの帯状未加硫ゴムの積層装置を提供することができる。

【図面の簡単な説明】

【図1】この発明の帯状未加硫ゴムの積層装置の概要側面図である。

【図2】この発明の第一の積層ゴム部材の模式的断面図である。

【図3】図2に示す第一の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図である。

【図4】この発明の第二の積層ゴム部材の模式的断面図である。

【図5】図4に示す第二の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図である。

【図6】この発明の第三の積層ゴム部材の模式的断面図である。

【図7】図6に示す第三の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図である。

【図8】この発明の第四の積層ゴム部材の模式的断面図である。

【図9】図8に示す第四の積層ゴム部材の各ゴム材料の供給比率と供給時間との関係をあらわす線図である。

【図10】図8に示す第四の積層ゴム部材の加硫後における各ゴムのモジュラス分布の説明図である。

【図11】この発明のタイヤの左半断面図である。

【図12】この発明の自動車のエンジンマウントブロックの断面図である。

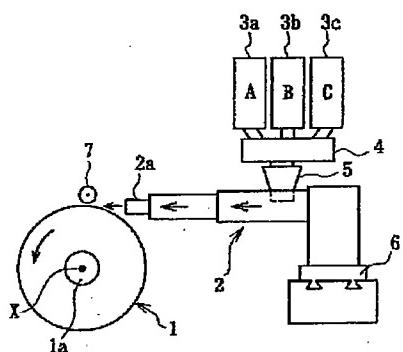
【符号の説明】

- 1 支持体
- 1 a 回転軸
- 2 押出機
- 2 a 供給部
- 3 a、3 b、3 c ゴム材料供給装置
- 4 供給量調整手段
- 5 ホッパ(フィーダ)
- 6 直状移動機構
- 7 ガイドローラ
- 10 タイヤ
- 11 ビード部
- 12 サイドウォール部
- 13 トレッド部

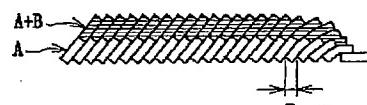
- 1 4 ビードコア
 1 5 ラジアルカーカス
 1 6 ベルト
 1 7 チェーファゴム
 1 8 サイドウォールゴム
 1 9 トレッドゴム
 2 0 インナーライナゴム
 2 1 ビードフィラーゴム

- (9) * 2 2 ミニサイドウォールゴム
 2 3 トレッドアンダーアッショングム
 2 4 トレッドベースゴム
 2 5 トレッドキャップゴム
 3 0 エンジンマウントブロック
 A、B、C ゴム材料
 X 中心軸線
 * p 送りピッチ

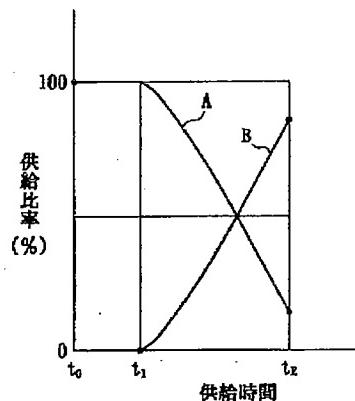
【図1】



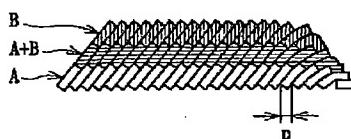
【図2】



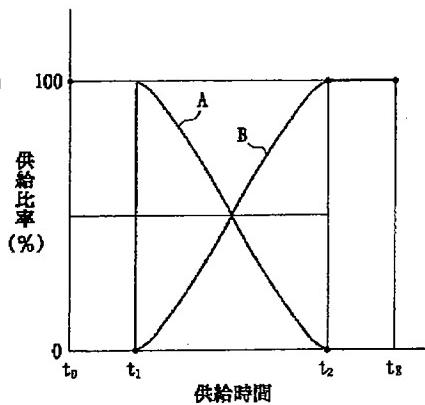
【図3】



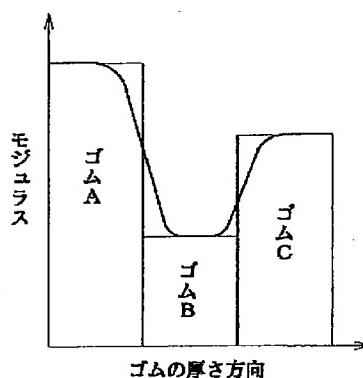
【図4】



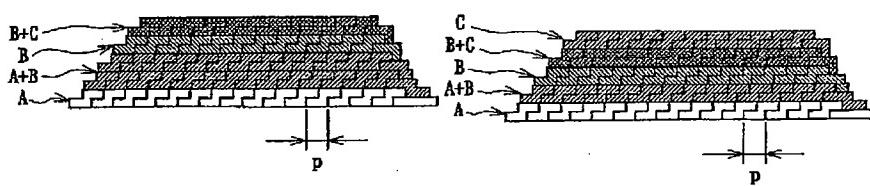
【図5】



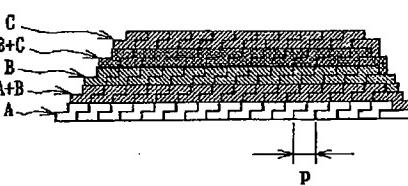
【図10】



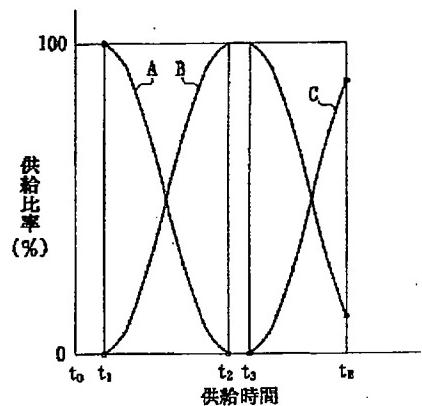
【図6】



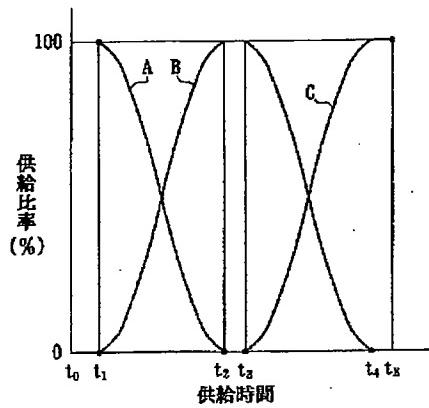
【図8】



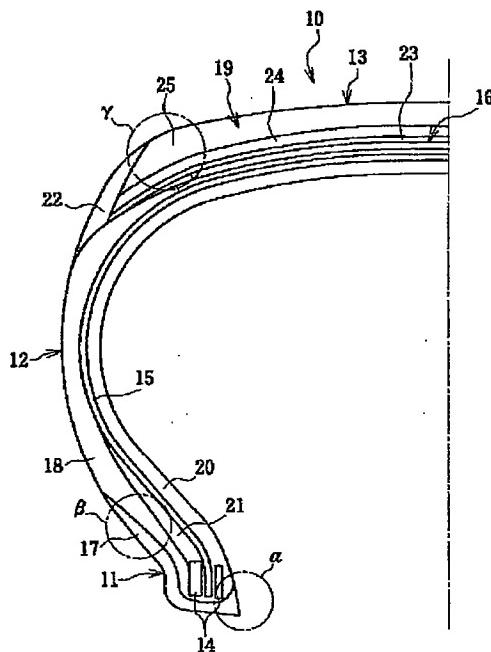
【図7】



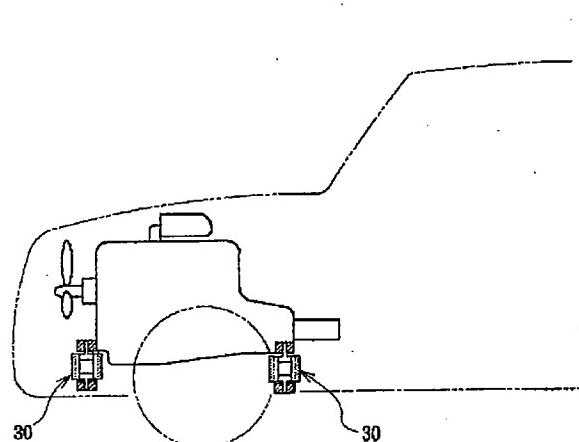
【図9】



【図11】



【図12】



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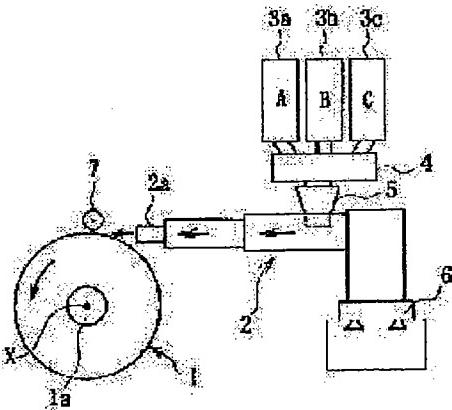
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(54) METHOD FOR LAMINATING STRIP-LIKE UNVULCANIZED RUBBER AND LAMINATION DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To ensure the sufficient durability, high precision and high productivity by using rubber compositions whose modulus varies in the order of supply after vulcanization, then extruding a first rubber material and blending this rubber material with a second rubber material as specified to mold a first lamination rubber member.

SOLUTION: Rubber materials A, B show a varying modulus between two different kinds of rubber material at least in the order of supply after vulcanization. First the first rubber material A is extruded from an extruder 2 and the extruded strip-like rubber is sequentially wound around the surface of a support 1 helically. Next a strip-like blended rubber obtained by adding the second rubber material B to the first rubber material A, is sequentially wound around the support 1 helically in the same excluded sectional shape to mold a first lamination rubber member. In this case, the blending ratio of the second rubber material B depends upon the stepwise increase and the gradual increase of the volume of at least, the first rubber material A. In addition, the strip-like rubber and the strip-like blended rubber are sequentially wound helically while mutually overlapping at least, the edge parts in the width direction of the strip-like rubber and the strip-like blended rubber.



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CLAIMS

[Claim(s)]

[Claim 1] Spiral winding of the band-like unvulcanized rubber extruded from an extrusion machine to a rotating base material is carried out, In molding a laminated rubber member with specified section shape, to a rubber material supplied to an extrusion machine. An after-vulcanization modulus uses two or more sorts of rubber compositions which are mutually different among 2 persons of the order of supply at least, After molding a rubber member of the same kind by band-like rubber which extrudes the first rubber material from an extrusion machine, and is extruded on rotating support and holding the same extrusion sectional shape succeedingly, Both kind rubber material that blended the second rubber material to the first rubber material by stepwise increase of a blend ratio and at least one increase in gradual increase is extruded from an extrusion machine, A laminating method of a band-like unvulcanized rubber making band-like rubber to extrude overlap at least a part of above-mentioned rubber member of the same kind, and molding the first laminated rubber member on rotating support.

[Claim 2] After holding the same extrusion sectional shape succeedingly after molding of the first laminated rubber member, A laminating method of a band-like unvulcanized rubber indicated to claim 1 which extrudes only the second rubber material from an extrusion machine, makes band-like rubber extruded on rotating support overlap at least a part of first laminated rubber member, and molds the second laminated rubber member.

[Claim 3] After holding the same extrusion sectional shape following on molding of the second laminated rubber member, Both kind rubber material that blended the third rubber material only to the second rubber material by stepwise increase of a blend ratio and at least one increase in gradual increase is extruded from an extrusion machine, A laminating method of a band-like unvulcanized rubber indicated to claim 2 which makes band-like rubber to extrude overlap at least a part of second laminated rubber member, and molds the third laminated rubber member on rotating support.

[Claim 4] After holding the same extrusion sectional shape succeedingly after molding of the third laminated rubber member, A laminating method of a band-like unvulcanized rubber indicated to claim 3 which extrudes only the third rubber material from an extrusion machine, makes band-like rubber extruded on rotating support overlap at least a part of third laminated rubber member, and molds the fourth laminated rubber member.

[Claim 5] A laminating method of a band-like unvulcanized rubber which indicated band-like rubber extruded from an extrusion machine to rotating support along a shaft direction of rotating support in any 1 paragraph of claims 1-4 of band-like rubber which carry out spiral winding one by one, and mold a rubber member while making a crosswise edge overlap mutually at least.

[Claim 6] A laminating method of a band-like unvulcanized rubber indicated in any 1 paragraph of claims 1-5 using a rubber composition which has physical properties from which a modulus and 1.0 or more MPa of at least one moduli of a 300% modulus differ in two sorts of the order of supply 100% after vulcanization in two or more sorts of rubber materials.

[Claim 7] A rubber composition for inner liners of an after-vulcanization tire is applied to two sorts of rubber materials, Either [at least] a halogenated butyl rubber constituent of air impermeableness or a butyl rubber composition is used for the first rubber material, A laminating method of a band-like unvulcanized rubber indicated in any 1 paragraph of claims 1, 2, 5, and 6 which use either [at least] a natural rubber composition or a crude rubber system synthetic rubber constituent for the second rubber material.

[Claim 8] To three sorts of rubber materials, a rubber composition for tread under cushions of an after-vulcanization tire, A laminating method of a band-like unvulcanized rubber indicated in any 1 paragraph of claims 1, 3, 4, 5, and 6 which apply a rubber composition for tread bases, and a rubber composition for a tread cap, and are extruded in this order as the first rubber material, second rubber

material, and third rubber material.

[Claim 9]A rubber composition for bead fillers, a rubber composition for sidewalls, and a rubber composition for rubber chafers of an after-vulcanization tire are applied to three sorts of rubber materials. A laminating method of a band-like unvulcanized rubber indicated in any 1 paragraph of claims 1, 3, 4, 5, and 6 extruded in this order as the first rubber material, second rubber material, and third rubber material.

[Claim 10]A laminating device of a band-like unvulcanized rubber characterized by comprising the following.

A pivotable base material which has a field with a volume of unvulcanized band-like rubber on the surface.

An extrusion machine which supplies band-like rubber to a field with a volume of this rotating support.

An amount-of-supply adjustment device which it has two or more rubber material feed units which supply individually two or more sorts of rubber materials to this extrusion machine, and each rubber material feed unit measures weight of a rubber material, and adjusts the amount of supply per unit time of a rubber material.

[Claim 11]A laminating device of a band-like unvulcanized rubber indicated to claim 10 characterized by comprising the following:

A stage when an extrusion machine feeds a measuring rubber material into an extrusion machine via an amount-of-supply adjustment device.

A control means which controls injection stopping times of this rubber material.

[Claim 12]A laminating device of a band-like unvulcanized rubber which either one of a base material and an extrusion machine indicated to claim 10 which has a moving mechanism in which relative displacement is possible in accordance with the axis of rotation of a base material, or 11.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention is in the laminating method of a band-like unvulcanized rubber and a laminating device, and the details of a twist. Two or more sorts of unvulcanized rubber materials in which the moduli (elastic modulus) after vulcanization differ are extruded with an extrusion machine. It is related with the laminating method and laminating device of a band-like unvulcanized rubber which are especially applied to molding of a pneumatic tire about the device which realizes the method of using as the rubber member which laminates the extruded band-like rubber on rotating support, and makes a group, and a method for the same.

[0002]

[Description of the Prior Art]Generally, the process of pasting various kinds of unvulcanized rubber members together before vulcanization of a complex when manufacturing is required for the complex which has various rubbers. Also in the complex of various rubbers and various reinforcing members, it is the same as the above. When this complex is a pneumatic tire (henceforth a tire), the tire is made of reinforcing members, such as a rubber coated cord, and various kinds of rubber members.

Therefore, the unvulcanized tire which pasted together charges of a reinforcing member, such as an unvulcanized rubber material and unvulcanized rubber coated cord material, at the molding process is prepared before tire curing.

[0003]However, nowadays shows the tendency which develops increasingly the demand characteristics over the rubber composite containing a tire, and is diversified increasingly. It doubled with this tendency and the members forming and the tire component of rubber composite are also diversified increasingly. Therefore, a molding process also cannot but become increasingly complicated. As a result, the actual condition is that full automation of a molding process becomes difficult and still needs help work. However, if help work is added, the improvement in large of molding efficiency cannot be attained, and the accuracy with tension of various materials will fall. In order that especially the quality of accuracy with tension may influence tire quality in the case of a tire, precision improvement is strongly desired with molding improve efficiency.

[0004]Then, in order to meet these requests, about a tire JP,7-94155,B, The outlet orifice of the constant-volume extrusion machine was located near the position which arranges a rubber material on the rotating base material, and the method and device which extrude a rubber material directly on a base material via an outlet orifice from a constant-volume extrusion machine are proposed.

[0005]

[Problem(s) to be Solved by the Invention]On the other hand, the advancement and diversification of demand characteristics over the rubber composite of a tire or others require the optimal physical properties of the rubber in each part of a tire, or each part of rubber composite. In order to satisfy this demand, property differences, such as a remarkable big modulus difference, arise between contiguity rubbers as a result.

[0006]Speaking of a tire, I hear that this has a plane of composition which presents a big modulus level difference into many portions of a tire, and it is in them. Therefore, under loading, over a long period of time, a strain concentrates on these planes of composition of the tire which runs not less than tens of thousands of km thing long distance repeatedly, and acts on them. As a result, it is easy to generate failure of separation etc. in these planes of composition, and endurance falls to them.

[0007]However, the above-mentioned gazette is touching on neither failure of this kind, nor endurance maintenance thru/or correspondence of durability enhancement. On the other hand, as for a tire, endurance and other performances including rubber composite have a 2 rate rebellion element mutually. That is, other degradation will be caused if improvement in endurance is aimed at by one side. A durable fall will be caused if other improved efficiency is aimed at on the other hand.

Therefore, each rubber serves as a rubber composition of the physical-properties design on which both were compromised suitably, and cannot realize optimal design of each rubber.

[0008]JP,40-24384,B has suggested one solution about this kind of problem. That is, the manufacturing method in which the predetermined part of a tire is made to form is proposed, facing the gazette sticking several different unvulcanized rubber materials on an unvulcanized carcass member, and changing from one unvulcanized rubber material gradually to other unvulcanized rubber materials at a target.

[0009]However, the indication of a gazette same as the above is a point using the roll apparatus of the number corresponding to the number of two or more unvulcanized rubber materials, and the mixing mill device of two or more unvulcanized rubber materials, and requires a huge space. Between roll apparatus and between a last roll device and the attachment position of an unvulcanized rubber material, the modification which is hard to control to various kinds of unvulcanized rubber strips arises. Therefore, fabricating the precise unvulcanized rubber member of sectional shape on an unvulcanized carcass member reaches to an extreme of difficulty. From these problems, the manufacturing method which a gazette same as the above indicates is inapplicable to molding automation.

[0010]Therefore, the invention indicated to claims 1-9 of this invention, After being premised on space-saving molding automation when manufacturing the rubber composite of a tire or others aiming at complete solution of many above-mentioned problems, Sufficient endurance maintenance of the rubber composite of a tire or others and application of the optimal-design rubber composition to each rubber are reconciled, and it sets to the eye 1 to provide the laminating method of the highly precise request sectional shape of each rubber, and the band-like unvulcanized rubber of a high throughput which can realize precise request arrangement.

[0011]As one device for realizing the invention indicated to claims 1-9, the invention indicated to claims 10-12 of this invention is easy and compact, and sets to provide the laminating device of the band-like unvulcanized rubber of low cost to that eye 2.

[0012]

[Means for Solving the Problem]In order to attain that eye 1 [said], an invention indicated to claim 1 of this invention, Spiral winding of the band-like unvulcanized rubber extruded from an extrusion machine to a rotating base material is carried out, In molding a laminated rubber member with specified section shape, to a rubber material supplied to an extrusion machine. An after-vulcanization modulus uses two or more sorts of rubber compositions which are mutually different among 2 persons of the order of supply at least, After molding a rubber member of the same kind by band-like rubber which extrudes the first rubber material from an extrusion machine, and is extruded on rotating support and holding the same extrusion sectional shape successively, Both kind rubber material that blended the second rubber material to the first rubber material by stepwise increase of a blend ratio and at least one increase in gradual increase is extruded from an extrusion machine, It is a laminating method of a band-like unvulcanized rubber making band-like rubber to extrude overlap at least a part of above-mentioned rubber member of the same kind, and molding the first laminated rubber member on rotating support.

[0013]A base material puts the body, a base tire for regeneration, etc. in the middle of molding which twisted a molding drum here and twisted some of unvulcanized rubber members, unvulcanized rubber coated cords, etc. on a molding drum. A molding drum is provided with the following.

A drum which makes the usual cylindrical shape.

An annular (toroid shape) segment aggregate disengageable to a circumferencial direction.

[0014]Like an invention which an invention indicated to claim 1 was developed further, and was indicated to claim 2, after holding the same extrusion sectional shape successively after molding of the first laminated rubber member, Only the second rubber material is extruded from an extrusion machine, on rotating support, band-like rubber to extrude is made to overlap at least a part of first laminated rubber member, and the second laminated rubber member is molded.

[0015]Like an invention which an invention indicated to claim 2 was developed further, and was indicated to claim 3, after holding the same extrusion sectional shape following on molding of the second laminated rubber member, Both kind rubber material that blended the third rubber material only to the second rubber material by stepwise increase of a blend ratio and at least one increase in gradual increase is extruded from an extrusion machine, On rotating support, band-like rubber to extrude is made to overlap at least a part of second laminated rubber member, and the third laminated rubber member is molded.

[0016]Like an invention which an invention indicated to claim 3 was developed further, and was

indicated to claim 4, after holding the same extrusion sectional shape succeedingly after molding of the third laminated rubber member, Only the third rubber material is extruded from an extrusion machine, on rotating support, band-like rubber to extrude is made to overlap at least a part of third laminated rubber member, and the fourth laminated rubber member is molded.

[0017]Making a crosswise edge overlap mutually to rotating support along a shaft direction of rotating support like an invention indicated to claim 5 about an invention indicated to claims 1-4, even if there is little band-like rubber about band-like rubber extruded from an extrusion machine, spiral winding is carried out one by one, and a rubber member is molded.

[0018]To claims 1-5, about an indicated invention suitably, A rubber composition which has physical properties from which a modulus and 1.0 or more MPa of at least one moduli of a 300% modulus differ in two sorts of the order of supply 100% after vulcanization in two or more sorts of rubber materials like an invention indicated to claim 6 is used.

[0019]In practice like an invention indicated to claim 7 about an invention indicated to claims 1, 2, 5, and 6, A rubber composition for inner liners of an after-vulcanization tire is applied to two sorts of rubber materials, Either [at least] a natural rubber composition or a crude rubber system synthetic rubber constituent is used for the first rubber material at the second rubber material using either [at least] a halogenated butyl rubber constituent of air impermeability, or a butyl rubber composition.

[0020]In practice like an invention indicated to claim 8 about an invention indicated to claims 1, 3, 4, 5, and 6, A rubber composition for tread under cushions of an after-vulcanization tire, a rubber composition for tread bases, and a rubber composition for a tread cap are applied to three sorts of rubber materials, and it extrudes in this order as the first rubber material, second rubber material, and third rubber material.

[0021]In practice like an invention indicated to claim 9 about an invention indicated to claims 1, 3, 4, 5, and 6, A rubber composition for bead fillers, a rubber composition for sidewalls, and a rubber composition for rubber chafers of an after-vulcanization tire are applied to three sorts of rubber materials, and it extrudes in this order as the first rubber material, second rubber material, and third rubber material.

[0022]In order to attain that eye 2 [said], an invention indicated to claim 10 of this invention, A pivotable base material which has a field with a volume of unvulcanized band-like rubber on the surface, and an extrusion machine which supplies band-like rubber to a field with a volume of this rotating support, It is a laminating device of a band-like unvulcanized rubber provided with an amount-of-supply adjustment device which it has two or more rubber material feed units which supply individually two or more sorts of rubber materials to this extrusion machine, and each rubber material feed unit measures weight of a rubber material, and adjusts the amount of supply per unit time of a rubber material.

[0023]An extrusion machine is provided with a control means which controls the stage to feed a measuring rubber material into an extrusion machine via an amount-of-supply adjustment device, and injection stopping times of this rubber material like an invention indicated to claim 11 about an invention indicated to claim 10.

[0024]Like an invention indicated to claim 12 about an invention indicated to claims 10 and 11, either one of a base material and an extrusion machine has a moving mechanism in which relative displacement is possible in accordance with the axis of rotation of a base material.

[0025]

[Embodiment of the Invention]Hereafter, this embodiment of the invention is described based on drawing 1 – drawing 10. Drawing 1 is the outline of the laminating device of the band-like unvulcanized rubber of this invention a shown side view, and drawing 2, Are a typical sectional view of the first laminated rubber member, and drawing 3, Are a diagram which expresses the relation of the rate of a delivery late of each rubber material of the first laminated rubber member and feed time which are shown in drawing 2, and drawing 4, Are a typical sectional view of the second laminated rubber member, and drawing 5, Are a diagram which expresses the relation of the rate of a delivery late of each rubber material of the second laminated rubber member and feed time which are shown in drawing 4, and drawing 6, Are a typical sectional view of the third laminated rubber member, and drawing 7, Are a diagram which expresses the relation of the rate of a delivery late of each rubber material of the third laminated rubber member and feed time which are shown in drawing 6, and drawing 8, It is a typical sectional view of the fourth laminated rubber member, drawing 9 is a diagram showing the relation of the rate of a delivery late of each rubber material of the fourth laminated rubber member and feed time which are shown in drawing 8, and drawing 10 is an explanatory view of modulus distribution of each rubber after vulcanization of the fourth laminated rubber member shown in drawing 8.

[0026]The base material 1 is attached to the axis 1a rotated by the drive of the rotating driving source which omitted the graphic display in drawing 1. The base materials 1 are the body, a base tire for regeneration, etc. in the middle of molding which twisted some of unvulcanized rubber members, unvulcanized rubber coated cords, etc. on the molding drum and the molding drum. The base material 1 has a field with a volume of unvulcanized band-like rubber (henceforth band-like rubber) on the surface. A base tire is a tire which removed the residual tread rubber of the used tire, etc.

[0027]Near the surface of the base material 1, the extrusion machine 2 is arranged so that the band-like rubber supply part 2a of the extrusion machine 2 may be located. A band-like rubber laminating device is a combination device of the base material 1 and the extrusion machine 2 here. The feed zone 2a includes the both sides of the case where it has usual extrusion port gold, and the case where it has a roller die of an up-and-down couple instead of extrusion port gold.

[0028]It has the rubber material feed units 3a, 3b, and 3c with which the extrusion machine 2 supplies two or more sorts, and the example of a graphic display supplies individually 3 sorts of unvulcanized rubber material (henceforth rubber material) A, B, and C. The rubber material feed units 3a, 3b, and 3c are provided with the amount-of-supply adjustment device 4 which adjusts individually the amount of supply of rubber material A, B, and C, respectively. Rubber material A which passed through the amount-of-supply adjustment device 4, B, and C are supplied to the main part of the extrusion machine 2 via a hopper thru/or the feeder 5.

[0029]moreover — although the graphic display was omitted — the extrusion machine 2 — rubber material A, B, and C — it crosses generally and has a control means which controls the stage to feed a measuring rubber material into the extrusion machine 2 via the amount-of-supply adjustment device 4, and the injection stopping times of this rubber material.

[0030]The extrusion machine 2 is provided with the direct-like moving mechanism 6. The direct-like moving mechanism 6 moves the extrusion machine 2 in the shape of direct along the axis line X of the axis of rotation 1a of the base material 1. This movement is for winding spirally the band-like rubber supplied from the feed zone 2a one by one to the field with a volume of the base material 1.

[0031]Therefore, the base material 1 may be provided with a direct-like moving mechanism (graphic display abbreviation) instead of the direct-like moving mechanism 6. When the field with a volume of the base material 1 is a curved surface with big curvature, in addition to the direct-like moving mechanism 6, the extrusion machine 2 is provided with a turning movement mechanism (graphic display abbreviation). A turning movement mechanism makes it circle in a feed zone 2a tip along the curved surface with a volume of the base material 1.

[0032]A band-like rubber laminating device has the guide idler 7 ahead of the feed zone 2a of the extrusion machine 2. It shows the guide idler 7 to the prescribed position of the field with a volume of the base material 1 turning around the band-like rubber supplied from the feed zone 2a.

[0033]Using the band-like rubber laminating device described above, spiral winding is carried out one by one, the band-like rubber extruded from the extrusion machine 2 is twisted around the rotating base material 1, and how to mold a laminated rubber member with specified section shape is explained hereafter.

[0034]Rubber material A supplied to the extrusion machine 2, B, and C are rubber compositions which have physical properties from which a modulus and 1.0 or more MPa of at least one moduli of a 300% modulus differ between the two-sort rubber materials of the order of supply 100% after vulcanization. That is, when supplying each rubber material to the extrusion machine 2 in order of rubber material A, B, and C, it is that 1.0 or more MPa of the above-mentioned moduli differ between rubber material A and B, and 1.0 or more MPa differs in them between rubber material B and C. It is not asked whether between these two-sort rubber materials, which rubber material has a bigger modulus. Hereafter, the order of supply is described as the above-mentioned passage.

[0035]Then, on the base material 1 (henceforth the rotating support 1) which supplies first rubber material A to the extrusion machine 2, and rotates the extruded band-like rubber A, spiral winding is carried out one by one, it twists, and of-the-same-kind rubber member A is molded. After holding the same extrusion sectional shape as the band-like rubber A following on this molding, the blend member (A+B) which added second rubber material B to first rubber material A is supplied to the extrusion machine 2. Spiral winding is carried out one by one on the rotating support 1, the band-like blend rubber (A+B) extruded from the extrusion machine 2 is twisted, and the first laminated rubber member [A+ (A+B)] is molded.

[0036]At this time, the blend ratio of second rubber material B makes it take at least one increase gestalt of a stepwise increase and gradual increase. Only in the case of a stepwise increase, the increase gestalt in a blend ratio contains three persons the case of only gradual increase, and in the case of the combination of a stepwise increase and gradual increase here. It is altogether the same

below.

[0037]Spiral winding with the band-like rubber A and band-like blend rubber (A+B) which are twisted on the rotating support 1 shall be as follows. namely, — receiving the rotating support 1 in accordance with the direction of axis X of the axis of rotation 1a of the rotating support 1 — the band-like rubber A and band-like blend rubber (A+B) — these — making a crosswise edge overlap mutually at least, spiral winding is carried out one by one, and rubber member A and (A+B) are molded. Band-like blend rubber (A+B) is made to overlap at least a part of of-the-same-kind rubber member A similarly. These overlap composition is common in all the laminated rubber members described below.

[0038]The laminating method of the band-like rubber described above is set the foundations of the laminating method described below, and it is shown in drawing 2 by making into a mimetic diagram the direction section of axis X of the rotating support 1 of the first laminated rubber member molded according to 1 of this gentleman method **. The first laminated rubber member shown in drawing 2 starts volume attachment to the rotating support 1 from the right-hand side of a figure, and carries out spiral winding of the band-like rubber A and the band-like blend rubber (A+B) by comparatively small feed pitch p. Although this lamination form is a ribbon form so to speak, the mosaic form mentioned later may be sufficient as it.

[0039]When drawing 3 molds the first laminated rubber member shown in drawing 2, it is rubber material A supplied to the extrusion machine 2, and a diagram explaining the rate of a delivery late of B (%), and a relation with feed time (t). In drawing 3, the supply time of onset t0 to the feed time t1 supplies only rubber material A to the extrusion machine 2. The blend of rubber material B is started from the feed time t1. Supply time-of-onset t0 Before the supply end time tE makes 100% clutteringly total of the amount of supply of rubber material A and rubber material B. Let the amount of supply be capacity. Hereafter, it is the same.

[0040]2 of ***** is explained. That is, after the first laminated rubber member [A+ (A+B)] molding by 1 of *****, after holding the same extrusion sectional shape as band-like blend rubber (A+B) successively, only second rubber material B is extruded from the extrusion machine 2. Spiral winding is carried out one by one on the first [of the rotating support 1] laminated rubber member [A+ (A+B)], the sent band-like rubber B is twisted, and the second laminated rubber member [A+(A+B) +B] is molded. The band-like rubber B is made to overlap at least a part of blend rubber member (A+B) at this time.

[0041]It is shown in drawing 4 by making into a mimetic diagram the direction section of axis X of the rotating support 1 of the second laminated rubber member molded according to 2 of *****. When drawing 5 molds the second laminated rubber member shown in drawing 4, it is rubber material A supplied to the extrusion machine 2, and a diagram explaining the rate of a delivery late of B (%), and a relation with feed time (t). In drawing 5, rubber material B starts supply by the feed time t1, and rubber material A stops supply by the feed time t2. The supply total amount of each rubber is 100% from the supply time of onset t0 before the supply end time tE.

[0042]3 of ***** is explained. That is, the blend member (B+C) which added third rubber material C only to second rubber material B is successively supplied to the extrusion machine 2 after the second laminated rubber member [A+(A+B) +B] molding by 2 of *****. Spiral winding is carried out one by one on the second [of the rotating support 1] laminated rubber member [A+(A+B) +B], the band-like blend rubber (B+C) extruded from the extrusion machine 2 is twisted, and the third laminated rubber member [A+(A+B) +B+ (B+C)] is molded.

[0043]At this time, the overlap composition in the blend ratio of third rubber material C and spiral winding of band-like rubber is as having stated previously.

[0044]It is shown in drawing 6 by making into a mimetic diagram the direction section of axis X of the rotating support 1 of the third laminated rubber member molded according to 3 of *****. When drawing 7 molds the third laminated rubber member shown in drawing 6, it is a diagram explaining the rate of a delivery late of rubber material A supplied to the extrusion machine 2, B, and C (%), and a relation with feed time (t). In drawing 7, rubber material B starts supply by the feed time t1, rubber material A stops supply by the feed time t2, and rubber material C starts supply by the feed time t3. The supply total amount of each rubber is 100% from the supply time of onset t0 before the supply end time tE.

[0045]4 of ***** is explained. That is, only third rubber material C is successively supplied to the extrusion machine 2 after the third laminated rubber member [A+(A+B) +B+ (B+C)] molding by 3 of *****. Spiral winding is carried out one by one on the third [of the rotating support 1] laminated rubber member [A+(A+B) +B+ (B+C)], the band-like rubber C extruded from the extrusion machine 2 is twisted, and the fourth laminated rubber member [A+(A+B) +B+(B+C) +C] is molded. At this time,

the overlap composition in spiral winding of band-like rubber is as having stated previously.

[0046]It is shown in drawing 8 by making into a mimetic diagram the direction section of axis X of the rotating support 1 of the fourth laminated rubber member molded according to 4 of *****. When drawing 9 molds the third laminated rubber member shown in drawing 8, it is a diagram explaining the rate of a delivery late of rubber material A supplied to the extrusion machine 2, B, and C (%), and a relation with feed time (t). In drawing 9, rubber material B starts supply by the feed time t1, rubber material A stops supply by the feed time t2, rubber material C starts supply by the feed time t3, and rubber material B suspends supply by the feed time t4. The supply total amount of each rubber is 100% from the supply time of onset t0 before the supply end time tE.

[0047]1- of ***** described above — even if rubber material A in the 4, B, and C have the same numerals — not the rubber composition not necessarily same between all directions methods but an all directions method — it is a rubber composition which changes with each. Change, injection stopping times, etc. of an input accompanying the supplying period of these rubber material A, B, and C and making time progress are controlled by the amount-of-supply adjustment device 4 and its control means.

[0048]1- of ***** — according to the 4, the effect stated to (1) – (6) below is done so.

(1) As shown in drawing 10, in the laminated rubber after vulcanization, the contiguity rubber B and the rigid big level difference between C had arisen the contiguity rubber A and between B conventionally. However, according to this invention, to a figure, as a curve shows, the rigid level difference between each contiguity rubber is cancelable. As a result, conventionally, exfoliation failure occurrences, such as separation produced at the contiguity rubber interface, can be avoided, and the endurance of a laminated rubber body can be raised substantially.

[0049](2) Among the contiguity rubbers A and B thru/or the contiguity rubbers B and C, on the other hand, to the rubber material of another side, green tackiness of a rubber material is insufficient at the time of molding, and, conventionally, it can solve thoroughly the problem which the adhesive agent had produced with the laminating method of this invention. This becomes that there is no manufacture poor generating based on the adhesive agent at the time of unvulcanized.

[0050](3) Conventionally, on the other hand, rubbers are a halogenated butyl rubber constituent and a butyl rubber composition, for example, The contiguity rubber of the adhesive strength after vulcanization is very insufficient at the time of rubber compositions, such as NR (crude rubber) system, IR (polyisoprene rubber) system, SBR (styrene butadiene rubber) systems, and these blend systems. However, no matter what rubber it may use, adhesive strength powerful enough can be obtained with the laminating method of this invention.

[0051](4) A rubber material can be easily changed continuously by extruding the band-like rubber which carries out spiral winding and is twisted around the rotating support 1 with the extrusion machine 2. As a result, the total man day which it becomes easy to automate fully of molding and molding takes can be reduced substantially, and productivity improves substantially.

[0052](5) The gauge and width of each band-like rubber can be set up suitably. What is made for the feed zone 2a tip of the extrusion machine 2 to approach the rotating support 1, With the combination of making [overlap at least a part of rubber member which carried out spiral winding previously]—making [overlap in part (edge) crosswise mutually]—band-like rubber twisted around rotating support 1, and band-like rubber twisted simultaneously **. With high precision, it is highly efficient in desired shape, and sectional shape of result each rubber member can be realized in it.

[0053](6) since a blend rubber field is formed in the laminated rubber after vulcanization, it is anxious to the physical properties of contiguity rubber, etc., and there is nothing — rubber material A, B, and C — it is alike, respectively, and it receives and the optimal physical-properties design can be performed independently. As a result, the laminated rubber after vulcanization can demonstrate advanced performance ideally.

[0054]

[Example]The example which applied the band-like rubber laminating method of this invention to the tire is described based on drawing 11. Drawing 11 is a left half section figure by the flat surface containing axis of rotation of a tire. In drawing 11, the tire 10 has the bead part 11 (only one side is shown) of a couple, the sidewall part 12 (only one side is shown) of a couple, and the tread part 13. The tire 10 is provided with the radial carcass 15 of 1 or more plies which reinforces each part 11, 12, and 13 over between [of the couple laid underground in the bead part 11] bead core 14, and the belt 16 which strengthens the tread part 13 with the periphery of the radial carcass 15. The terminal part of the radial carcass 15 is stopped between the bead cores 14 which make a pair.

[0055]The tire 10 has the tread rubber 19 with the chafer rubber 17 in the bead part 11 as the outer rubber member at the periphery side of the side wall rubber 18 and the belt 16 of the tread part 13 at

the sidewall part 12.

[0056]The tire 10 has the inner liner rubber 20 as the inside rubber member, and has the bead filler rubber 21 as an internal reinforcement rubber member of the sidewall part 12 from the bead part 11. The tire 10 is sometimes provided with the mini side wall rubber 22 which achieves the role of mediation of the side wall rubber 18 and the tread rubber 19 as the outer rubber member.

[0057]Generally the tread rubber 19 has [the tread under cushion rubber 23 for securing adhesion with the belt 16] the multilayer structure of an interlayer and the tread cap rubber 25 for the tread base rubber 24 in the innermost side.

[0058](1 of *****) All of the tire for cars are almost tubeless (henceforth T/L) tires here these days. The basic characteristic with an important T/L tire is the airtight holdout of filling air.

Therefore, either [at least] the halogenated butyl rubber constituent of air impermeableness or a butyl rubber composition is used for the inner liner rubber 20.

[0059]The covering rubber of the reinforcement cord of one of these and the radial carcass 15 is a rubber composition of NR system, IR system, and an SBR system. The adhesive property after vulcanization is inferior in the rubber composition, halogenated butyl rubber constituent, and butyl rubber composition of these systems. As a result, exfoliation arises between both kind rubbers in many cases. Therefore, either of the second laminated rubber member {A+(A+B)+B} according to 2 of the first laminated rubber member {A+(A+B)} according to 1 of ***** explained previously or ***** is applied to the inner liner rubber 20. In this case, rubber member A and a rubber member (A+B) — rubber member (A+B) and rubber member B is made to overlap all over the districts mostly

[0060]The rubber composition of NR system, IR system, and an SBR system is applied to rubber material A. A halogenated butyl rubber constituent and a butyl rubber composition are applied to rubber material B. If it does in this way, the covering rubber constituent of a reinforcement cord will be approached as the rubber composition near the radial carcass 15. As a result, the exfoliation failure between the covering rubber of a reinforcement cord and the inner liner rubber 20 can be prevented. The covering rubber of a reinforcement cord is compared with a halogenated butyl rubber constituent and a butyl rubber composition, and has a modulus and a 300% modulus 100% high 1 or more MPa.

[0061](2 of *****) The interface of the chafer rubber 17 of the quality excellent in rim **** resistance of superhard and the elastic inner liner rubber 20 exists in alpha field (toe part) shown in drawing 11 with a circle [of a dashed dotted line]. For this reason, it is easy to produce tow chip failure at the time of rim **** at the time of the rim group of the tire 10. Therefore, the fourth laminated rubber member {A+(A+B)+B+(B+C)+C} according to 4 of the third laminated rubber member {A+(A+B)+B+(B+C)} according to 3 of ***** or ***** is applied to the chafer rubber 17 and the inner liner rubber 20.

[0062]In this case, the inner liner rubber 20 applies the second laminated rubber member {A+(A+B)+B} previously.

Then, BR (butadiene rubber) system rubber composition for the chafer rubbers 17 is used for rubber material C, and the third laminated rubber member {A+(A+B)+B+(B+C)} or the fourth laminated rubber member {A+(A+B)+B+(B+C)+C} is completed.

In this case, a rubber member (B+C) or a laminated rubber member [(B+C)+C] is made to overlap the both sides of a laminated rubber member {A+(A+B)+B} part. The 100% modulus of the chafer rubber 17 is 4.0 – 8.0MPa.

It is higher than the after-vulcanization 100% modulus of rubber material B 1 or more MPa.

A tow chip is avoidable now.

[0063](3 of *****) big [directly under / loading / the tire 10] in beta field shown in drawing 11 with a circle [of a dashed dotted line] — it bends and a strain occurs. The side wall rubber 18 which excelled [modulus] in weatherability and flexibility 100% on the other hand is 1.0 – 2.5MPa, and the bead filler rubber 21 aiming at reinforcement strengthening of the bead part 11 is 5.0 – 10.0MPa. Therefore, beta field is seen in the thickness direction of rubber, and presents the modulus array form shown in drawing 10. With this modulus level difference, rubber interface exfoliation failure often arises to beta field.

[0064]Therefore, the fourth laminated rubber member {A+(A+B)+B+(B+C)+C} according to 4 of ***** is applied to the bead filler rubber 21, the side wall rubber 18, and the chafer rubber 17. The rubber composition of the bead filler rubber 21 and rubber member B consider it as the rubber composition of the side wall rubber 18, and rubber member C uses rubber member A as the rubber composition of the chafer rubber 17. By using this fourth laminated rubber member, as shown in drawing 10, modulus distribution becomes curve-like and a modulus level difference is lost in practice. It stops as a result, generating rubber interface exfoliation failure. Also in this case, each

laminated rubber member is mutually considered as a part of overlap.

[0065](4 of *****) In gamma field shown in drawing 11 with a circle [of a dashed dotted line], a big strain occurs directly under [loading] the tire 10. On the other hand, the covering rubber of a high modulus to which a modulus suits covering of a steel cord 300%, and the tread under cushion rubber 23 of the same kind are 15 – 18MPa, The tread base rubber 24 which is rich in cushioning properties is 5 – 12MPa, and the tread cap rubber 25 which is excellent in abrasion resistance or driving stability is 7 – 13MPa. In practice, it has a modulus difference of 1.0 or more MPa between contiguity rubbers. Therefore, gamma field is also seen in the thickness direction of rubber, and presents the modulus array form shown in drawing 10. With this modulus level difference, rubber interface exfoliation failure often arises to gamma field.

[0066]Therefore, the fourth laminated rubber member {A+(A+B) +B+(B+C) +C} according to 4 of ***** is applied to the tread rubber 19. The rubber composition of the tread under cushion rubber 23 and rubber member B consider it as the rubber composition of the tread base rubber 24, and rubber member C uses rubber member A as the rubber composition of the tread cap rubber 25. By using this fourth laminated rubber member, as shown in drawing 10, modulus distribution shows a curve and a modulus level difference is lost in practice. It stops as a result, generating rubber interface exfoliation failure. Each laminated rubber member in this case is mutually considered mostly as the overlap covering overall width.

[0067]4 of ***** is developed further, and the mini side wall rubber 22 which is excellent in conductivity can also set the rubber composition to rubber material D, and can also mold the fifth laminated rubber member. In this case, rubber material D is taken as the rubber composition of the side wall rubber 18. The laminated rubber member which has rubber material D is made to overlap the both sides of other laminated rubber members part.

[0068](Other examples) Drawing 12 is a sectional view of an engine-mount block of a car. In drawing 12, the engine-mount block 30 is one side, it needs the rubber which has a high damping effect so that it may change, and it needs the rubber which is excellent in weatherability on the other hand. Therefore, the second laminated rubber member {A+(A+B) +B} according to 2 of ***** is applied to the engine-mount block 30.

[0069]That is, the rubber B of the rubber composition which has a high damping effect to inside rubber is used for the outer rubber of the engine-mount block 30 using rubber material A of a rubber composition which is excellent in weatherability. A military requirement can be made to fully satisfy using the rubber physical property which conflicts mutually by this. Rubber member A, rubber member (A+B), and rubber member B is made to overlap all over the districts mostly also in this case. although explanation is omitted in addition to engine-mount block 30 — a rubber cushion, a fender, etc. — 1– of ***** — the 4 and its development method are used.

[0070]

[Effect of the Invention]According to the invention indicated to claims 1–9 of this invention, when manufacturing the rubber composite of a tire or others under the molding automation by space-saving, Sufficient endurance maintenance of the rubber composite of a tire or others and application of the optimal-design rubber composition to each rubber can be reconciled, and the laminating method of the band-like unvulcanized rubber of a high throughput which can realize easily highly precise request sectional shape of each rubber and precise request arrangement can be provided. According to the invention indicated to claims 10–12 of this invention, it has an easy and compact structure and the laminating device of the band-like unvulcanized rubber of the low cost which can realize certainly the invention indicated to claims 1–9 can be provided.

[Translation done.]

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- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is an outline side view of the laminating device of the band-like unvulcanized rubber of this invention.

[Drawing 2]It is a typical sectional view of the first laminated rubber member of this invention.

[Drawing 3]It is a diagram showing the relation of the rate of a delivery late of each rubber material of the first laminated rubber member and feed time which are shown in drawing 2.

[Drawing 4]It is a typical sectional view of the second laminated rubber member of this invention.

[Drawing 5]It is a diagram showing the relation of the rate of a delivery late of each rubber material of the second laminated rubber member and feed time which are shown in drawing 4.

[Drawing 6]It is a typical sectional view of the third laminated rubber member of this invention.

[Drawing 7]It is a diagram showing the relation of the rate of a delivery late of each rubber material of the third laminated rubber member and feed time which are shown in drawing 6.

[Drawing 8]It is a typical sectional view of the fourth laminated rubber member of this invention.

[Drawing 9]It is a diagram showing the relation of the rate of a delivery late of each rubber material of the fourth laminated rubber member and feed time which are shown in drawing 8.

[Drawing 10]It is an explanatory view of modulus distribution of each rubber after vulcanization of the fourth laminated rubber member shown in drawing 8.

[Drawing 11]It is a left half section figure of the tire of this invention.

[Drawing 12]It is a sectional view of an engine-mount block of the car of this invention.

[Description of Notations]

1 Base material

1a Axis of rotation

2 Extrusion machine

2a Feed zone

3a, 3b, 3c rubber material feed unit

4 Amount-of-supply adjustment device

5 Hopper (feeder)

6 Direct-like moving mechanism

7 Guide idler

10 Tire

11 Bead part

12 Sidewall part

13 Tread part

14 Bead core

15 Radial carcass

16 Belt

17 Chafer rubber

18 Side wall rubber

19 Tread rubber

20 Inner liner rubber

21 Bead filler rubber

22 Mini side wall rubber

23 Tread under cushion rubber

24 Tread base rubber

25 Tread cap rubber

30 Engine-mount block

A, B, C rubber material

X Axis line

p Feed pitch

[Translation done.]

* NOTICES *

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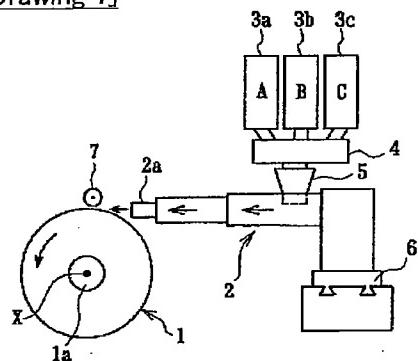
1. This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

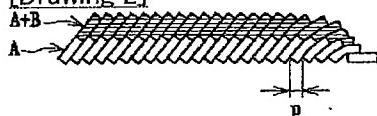
3. In the drawings, any words are not translated.

DRAWINGS

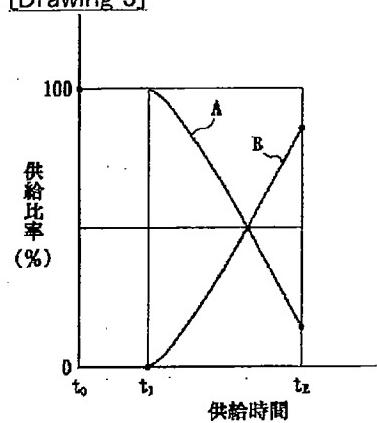
[Drawing 1]



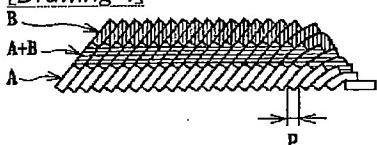
[Drawing 2]



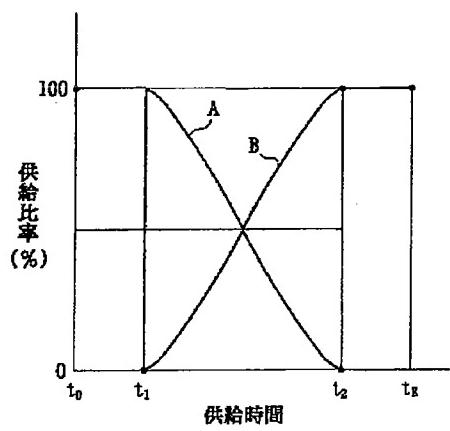
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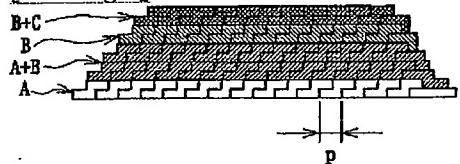
[Drawing 4]



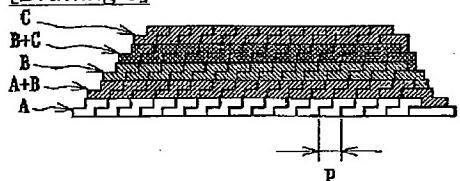
[Drawing 5]



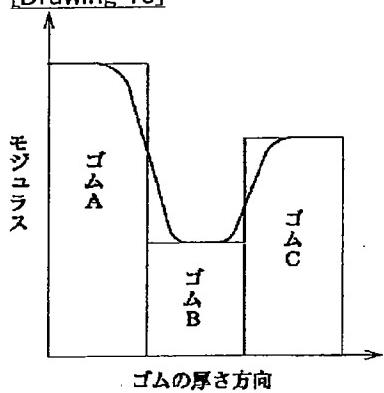
[Drawing 6]



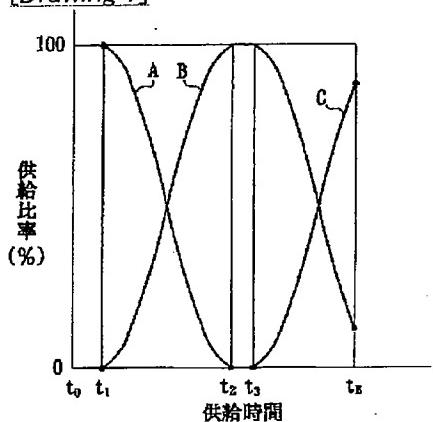
[Drawing 8]



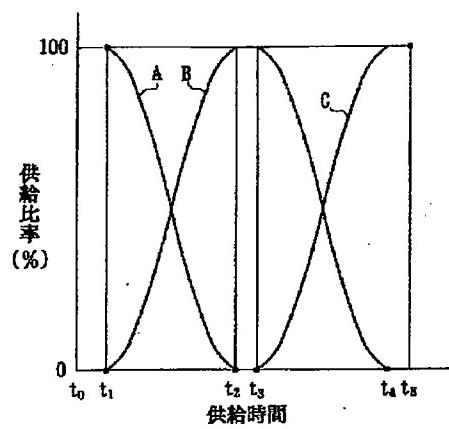
[Drawing 10]



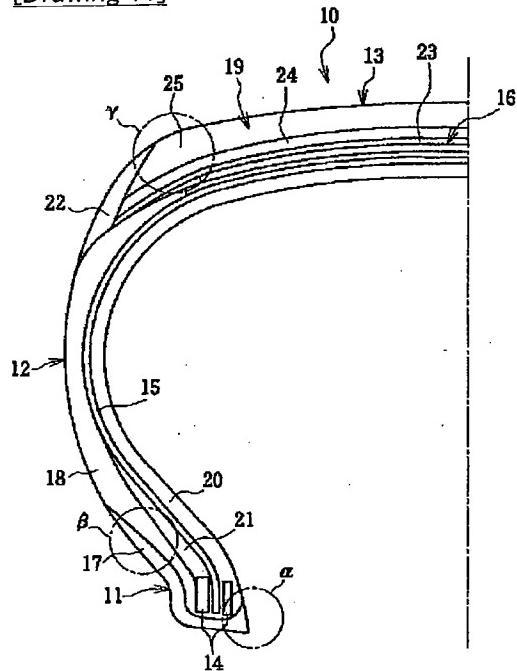
[Drawing 7]



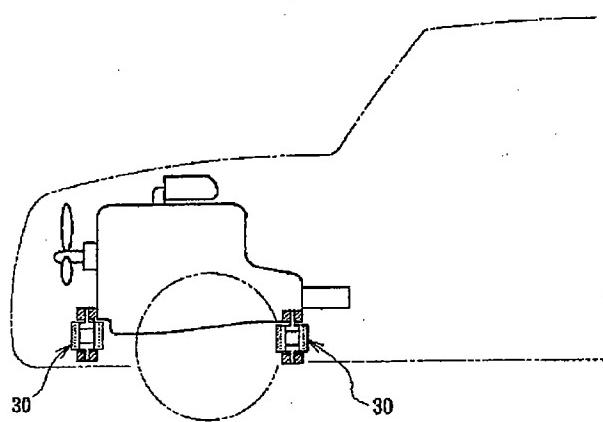
[Drawing 9]



[Drawing 11]



[Drawing 12]



[Translation done.]